

# THE DOE-2 USER NEWS

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DOE-2: A COMPUTER PROGRAM FOR  
BUILDING ENERGY SIMULATION

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## ✉ ✉ HANDS ON ✉ ✉

### ✉ What Price, DOE-2 ?

Each January NTIS raises the price of DOE-2 documentation; we'll print the new prices as soon as we get them. However, if you do order documentation around the first of the year, bear in mind that the prices reflected in the User News may be out of date. Be sure to call NTIS and confirm.

### ✉ Ayudarme! Hilfe! Aide! Aiuto!

European users who need assistance with the mainframe version of DOE-2 should contact Joerg Tscherry at EMPA (Swiss National Laboratory for Materials Testing), Section 175, 8600 Dubendorf, Switzerland. Phone (01) 823-5511 or fax (01) 821-6244.

PC DOE-2 users should contact Werner Gygli at Informatik Energietechnik, Weiherweg 19, CH-8604 Volketswil, Switzerland, for consulting or training.

### ✉ Conferences and Workshops

Aug 20-22, 1991 — *Building Simulation '91*.....  
in Nice, France. Second World Congress on Technology Improving the Energy Use, Comfort, and Economics of Buildings Worldwide. Sponsor: IBPSA, the International Building Performance Simulation Association. Co-Sponsors: AFME, BAG, BPA, BEPAC, CEC-DGXII, DOE, EPRI, GRI, JRC, NOVEM, USA-CERL, PWC. Contact: Philippe Geril, IBPSA-BS'91, Coupure Links 653, B-9000 Ghent, Belgium. FAX: 32.91.24.40.93. E-MAIL: SCSi@BGERUG51.BITNET

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## ■ ■ ■ HEAT EXCHANGER ■ ■ ■

It has come to our attention that portions of the DOE-2.1D Update Package need clarification and/or correction. Please make a note of the following modifications and change your documentation accordingly.

### 2.1D Supplement

- 1) Throughout the 2.1D *Supplement*, system type **PVAVS** was incorrectly referred to as **PVAV**, and system type **PMZS** was incorrectly referred to as **PMZ**.

- 2) At the bottom of page 3.15 of the 2.1D *Supplement* there is a list of keywords that applies to heat pumps.

**MAX-SUP-T** should be changed to **MAX-HP-SUPP-T**.

- 3) On page 3.16 of the 2.1D *Supplement*, we stated that "*For the systems (PSZ,PVAV,PMZ,PTAC) that accept the code word HEAT-PUMP.....*"

There are clarifications and corrections here:

- First, **PVAV (PVAVS)** and **PMZ (PMZS)** should be deleted from the list.

The reason for this is that varying the flow of air on the indoor coil is not compatible with a heat pump operating in the heating mode. Reducing the volume of air passing over the condensing coil (which is the evaporator during cooling) would result in high condensing pressures and cause a high head pressure safety switch to cut out the compressor operation. A packaged multizone system (PMZS) employing a heat pump would also vary the flow of air, which again is unacceptable.

- The residential system (RESYS) should have been included in the list.
- 4) On page 3.29 of the 2.1D *Supplement*, under the description of the Packaged Total-Gas Solid-Desiccant System, please add:  
The first-named zone in ZONE-NAMES = (list of zones) is the "control zone".

## 2.1D BDL Summary

At the bottom of page 3 of the 2.1D *BDL Summary* we wrote a schedule as follows:

```
NORMAL = WEEK-SCHEDULE  (MON,TUE,WED,THU,FRI)  LTG-1
                        (SAT,SUN,HOL)           LTG-2 ..
```

On page 4 we stated that "*Optionally, NORMAL can be shortened to...*"

```
NORMAL = WEEK-SCHEDULE  (WD) LTG-1 (WEH) LTG-2 ..
```

We were trying to demonstrate that (MON,TUE,WED,THU,FRI) may also be written as (WD), an abbreviation of "Weekdays"; and further that (SAT,SUN,HOL) may also be written as (WEH), an abbreviation of "Weekends and Holidays".

The problem is that (MON,TUE,WED,THU,FRI) is an incorrect format and must be written as (MON,FRI) and interpreted by the program as Monday through Friday, and that (SAT,SUN,HOL) is also incorrect and must be written as (SAT,HOL).



# **DOE-Plus<sup>TM</sup>**

## **An Interactive Pre- and Post-Processor for DOE-2**

by  
Steve Byrne  
Building Blocks Software  
P.O. Box 5218  
Berkeley, CA 94705-0218

During the late 1970's, when the user interface for DOE-2 was first developed, nearly all computing was done on large mainframes operating in batch mode. With today's powerful microcomputers and software, users have come to expect a far more friendly operating environment. DOE-Plus<sup>TM</sup> is a program that meets the need for an interactive environment by providing the means to quickly and easily input data and analyze results. DOE-Plus<sup>TM</sup> is valuable to both beginning and experienced DOE-2 users because of the interactive help and error detection, the reduced time needed to fully describe a building for simulation by the program, and the powerful set of utilities for analyzing input data and the results of DOE-2 simulations.

Building energy simulation programs developed prior to DOE-2 usually required input files comprised solely of numbered fields, which made developing and understanding the input data both difficult and error prone. The Building Description Language (BDL) of DOE-2 was an important step forward in developing a user-friendly interface because the "keyword equals value" approach in BDL allows users to easily read and/or modify an input file. However, it can be very time consuming to develop a BDL input file and, as the list of keywords continues to grow with each new release of DOE-2, it is increasingly difficult to remember exact definitions and acceptable values, especially for seldom-used commands and keywords.

DOE-Plus represents the next generation of software with an interactive environment that significantly reduces the amount of time needed to input data, provides on-line help for all DOE-2 keywords, and makes available a host of utilities that aids the user in preparing DOE-2 input and in analyzing the results of simulations.

### **Compatibility**

DOE-Plus was developed specifically to provide users with an interactive environment for processing DOE-2 data, and can be used to generate a BDL file that can then be used on any standard version of DOE-2.1D (either microcomputer or mainframe versions). DOE-2.1D can optionally be purchased with DOE-Plus, in which case DOE-Plus can execute DOE-2.1D directly in an integrated environment.

## Features

DOE-Plus runs on IBM-PC compatible computers and provides full mouse support, pull-down menus, pop-up option lists, context-sensitive help for every DOE-2 keyword, interactive error detection and correction, and support for a full range of graphics and non-graphics hardware.

The design of DOE-Plus reflects many years of DOE-2 experience. DOE-Plus makes extensive use of on-line libraries to store and retrieve schedules, materials, constructions, systems, etc., and all the libraries can be completely customized. Required and linked DOE-2 commands and keywords are automatically identified and are logically grouped according to application. Time saving DOE-2 commands, such as SET-DEFAULT and LIKE are fully implemented. Standard default values and limits are displayed for every keyword. DOE-Plus objects (such as schedules, walls, or windows) are identified by the familiar DOE-2 U-names. In order to minimize the time needed to learn a new program, DOE-Plus makes use of the same keywords used in DOE-2. With only minutes of instruction, experienced DOE-2 users can use DOE-Plus. Also, the "help" facility and error checking features in DOE-Plus are expected to make the program easy to use for beginning DOE-2 users.

DOE-Plus offers several built-in utilities that significantly improve its usefulness. For example:

- DOE-Plus can display a tree-like structure of a user's building description file, identifying relationships between objects (such as EXTERIOR-WALLs and SPACES). At the push of a button, the user can quickly jump to any object and edit or delete it.
- DOE-Plus can display a two- or three-dimensional view of a building, allowing the user to quickly verify the location of the walls, windows, doors, shades, etc., that have been input. Mislocated objects can be quickly identified and corrected.
- DOE-Plus can display two- or three-dimensional plots of variables calculated by DOE-2, enabling rapid and thorough analysis of results. A user is no longer limited to tables of printed numbers.
- DOE-Plus can display a full-year calendar for any year, so that the user can conveniently identify dates used in DOE-2 schedules. The user can page through years at the click of a mouse or by using the "Page-Up" or "Page-Down" keys.

The output from these utilities can be either displayed on the computer monitor or sent to a printer. Only the view of a building and the plots of simulation results require a graphics monitor and/or printer.

## Examples

The following sample screens illustrate the capabilities of DOE-Plus.

File Loads Systems Plant Economics Utilities Quit

Header Information  
SCHEDULE  
FUNCTION  
BUILDING-LOCATION

EXTERIOR-WALL

SIDE-WALL -EXTERIOR-WALL Attached to SPACE \* SOUTH-SIDE

LIKE =  
HEIGHT = 10.5 WIDTH = 43 MULTIPLIER = 1  
X = 134 Y = 65 CONSTRUCTION = CONS2  
AZIMUTH = 270 TILT = 90 Z = 0  
GND-REFLECTANCE = 0.2

SHADING-SURFACE = NO SHADING-DIVISION = 10  
SKY-FORM-FACTOR = 0.5 GND-FORM-FACTOR = 0.5  
INF-COEF = 0 SOLAR-FRACTION =  
INSIDE-VIS-REFL = INSIDE-SOL-ABS =  
FUNCTION = LOCATION =

Range = 0.0 - 1.0 (Default = 0.2) OK Cancel

<F1> Help, f+I+ Move, <ESC> Cancel

**Figure 1** A typical input window, in this case for the EXTERIOR-WALL command. Note the keyword-specific prompt, indicating valid input range and default value displayed at the bottom of the window. The pull-down menu for Loads is displayed behind the input window.

Figure 1 shows the pull-down menu system that is controlled with the mouse or cursor keys. The menu is divided into the familiar DOE-2 Loads, Systems, Plant and Economics categories, as well as DOE-Plus file handling routines and the utilities described above. Clicking on a menu selection (in this case, Loads and then EXTERIOR-WALL), activates the appropriate input window.

Each field in the input window is initially set to the standard default or user-specified SET-DEFAULT value. If a field is modified, it is highlighted to indicate that there has been a change. The user can input data in any order. As the user moves through each input field, a prompt is displayed at the bottom of the window that indicates valid input range as well as the default value. In this example, the mouse is currently over the GND-REFLECTANCE field, so the valid range and default values for GND-REFLECTANCE are displayed at the bottom of the window. DOE-Plus automatically checks all input upon entry and notifies the user of any error, providing immediate feedback.



Each input window is divided into keywords that are recommended or required (above the horizontal line) and those that are optional (below the line). Required keywords are color-coded. In this manner, a beginning user can quickly identify the minimum recommended input.

Figure 1 also shows use of the "Attached to" command in DOE-Plus that allows an object, such as a wall or a window, to be specified at any time after the object to which it is attached (in this case the space named "SOUTH-SIDE"). DOE-Plus handles all ordering of data internally, so the user need not specify position-sensitive DOE-2 commands (such as SPACE and EXTERIOR-WALL) in sequential order.

File Loads Systems Plant Economics Utilities Quit

Header Information  
SCHEDULE  
FUNCTION  
BUILDING-LOCATION

EXTERIOR-WALL  
SIDE-WALL -EXTERIOR-WALL Attached to SPACE » SOUTH-SIDE

LIKE -  
HEIGHT = 10.5 WIDTH = 43 MULTIPLIER = 1  
X = 134 Y = 65 CONSTRUCTION = CONS2  
AZIMUTH = 270 TILT = 90 Z = 0  
GND-REFLECTANCE = 0.2

SHADING-SURFACE = NO SHADING-DIVISION = 10

GND-REFLECTANCE

is the solar reflectance of the ground; i.e., the fraction of sunlight incident on the ground that is reflected. The following table has typical values for various surfaces:

Surface	GND-REFLECTANCE
Concrete, Light Colored	0.32

Press Escape

<F1> Help, ↑↓ Move, <ESC> Cancel

Figure 2 The same EXTERIOR-WALL input window as in Figure 1, with a help window displayed for the GND-REFLECTANCE keyword. The help window can be scrolled up or down to show additional text.

If help is needed on any keyword, pressing the <F1> key will display a scrollable window with a description of that keyword and example input values. This powerful help facility significantly reduces the need to refer to the DOE-2 manuals. In Fig. 2, the user has pressed <F1> while in the GND-REFLECTANCE field, displaying the help window shown. The mouse, cursor, or page keys can be used to scroll through additional lines in the help window (in this case, additional typical values for GND-REFLECTANCE). Pressing <ESC> removes the help window and returns control to the EXTERIOR-WALL window.

After completing an input window, the user clicks on OK to save the entries and return to the menu. Clicking on Cancel or pressing <ESC> at any time aborts changes to that window and immediately returns the user to the menu. The user then selects another item from the menu, such a new input window or a DOE-Plus utility. Building description files created with DOE-Plus can be saved on disk for future editing.

DOE-2 commands with more extensive input options are subdivided into logical categories of keywords; see Fig. 3, which shows the input window for the SPACE command. The minimum input is displayed as before, but the optional keywords are now replaced with topical categories, such as Occupancy, Lighting, Equipment, etc. If the user wants to specify more detail in any of those categories, the cursor is moved to the name of the category and clicked to display an overlapping input window with those additional keywords (see Fig. 4). The user can then modify any of the optional keywords in the overlapping window and/or return to the primary window by clicking on OK or Cancel.

File Loads Systems Plant Economics Utilities Quit

SPACE

GEN-OFFICE - SPACE

LIKE - NORTH-SIDE  
 AREA = 1200  
 MULTIPLIER = 1  
 SPACE-CONDITIONS = OFFICE-1  
 PEOPLE-SCHEDULE = SCH-2  
 LIGHTING-SCHEDULE = **LIGHTING-SCHEDULE**  
 EQUIP-SCHEDULE = SCH-1  
 INF-SCHEDULE =

Optional Keywords by Category:

Occupancy	Lighting	Equipment	Infiltration
Task Lighting	Daylighting	Source Load	Weighting-Factor
Geometry	Miscellaneous		

U-NAME of a defined SCHEDULE (Default = no lighting)

OK Cancel

<F1> Help, ↑↓ Move, <ESC> Cancel

Figure 3 An input window with topical categories for optional keywords. Note the pop-up option list displayed for the LIGHTING-SCHEDULE keyword. Additional schedules in the DOE-Plus library can be shown by clicking on the <library> option.



Figure 3 also shows one of the most useful features of DOE-Plus — the pop-up display of options. When in any appropriate input field, pressing the space bar or clicking the mouse displays a pop-up window of all possible entry values. In Fig. 3 the user has displayed the names of all schedules that were defined earlier. Clicking on the desired schedule will place that U-name in the LIGHTING-SCHEDULE field and so eliminate the need to retype the U-name. In this manner, data can be rapidly entered without making typing mistakes.

To choose a schedule in the DOE-Plus library, the user simply clicks on <Library> and the list shown in Fig. 3 is replaced by a list of all schedules in the DOE-Plus library file. The user can then select any of these library schedules in a similar manner to choosing a user-defined schedules. DOE-Plus is shipped with an extensive library of schedules, materials, constructions, system types, etc. The library can be customized by the user for a particular application.

File Loads Systems Plant Economics Utilities Quit

SPACE

GEN-OFFICE - SPACE

LIKE - NORTH-SIDE  
 AREA - 1200  
 MULTIPLIER - 1  
 SPACE-CONDITIONS - OFFICE-1  
 PEOPLE-SCHEDULE - SCH-2  
 LIGHTING-SCHEDULE - SCH-3  
 EQUIP-SCHEDULE - SCH-3  
 INF-SCHEDULE - SCH-4

VOLUME - 14400  
 FLOOR-MULTIPLIER - 1  
 AREA/PERSON - 150  
 LIGHTING-W/SQFT - 1.75  
 EQUIPMENT-W/SQFT - 0.2  
 AIR-CHANGES/HR - 0.5

Optional Keywords by Category:

Occupancy Lighting Equipment Infiltration

Daylighting Keywords

DAYLIGHTING - YES  
 LIGHT-REF-POINT1 =  
 LIGHT-REF-POINT2 =  
 LIGHT-CTRL-TYPE1 = STEPPED  
 LIGHT-CTRL-TYPE2 = CONTINUOUS  
 MIN-POWER-FRAC = 0.3  
 MIN-LIGHT-FRAC = 0.2  
 DAYLIGHT-REP-SCH =

VIEW-AZIMUTH =  
 FRACTION1 = 1.0  
 FRACTION2 =  
 SET-POINT1 = 50  
 SET-POINT2 = 50  
 LIGHT-CTRL-STEPS = 3  
 LIGHT-CTRL-PROB = 1.0  
 MAX-GLARE = 100

OK Cancel

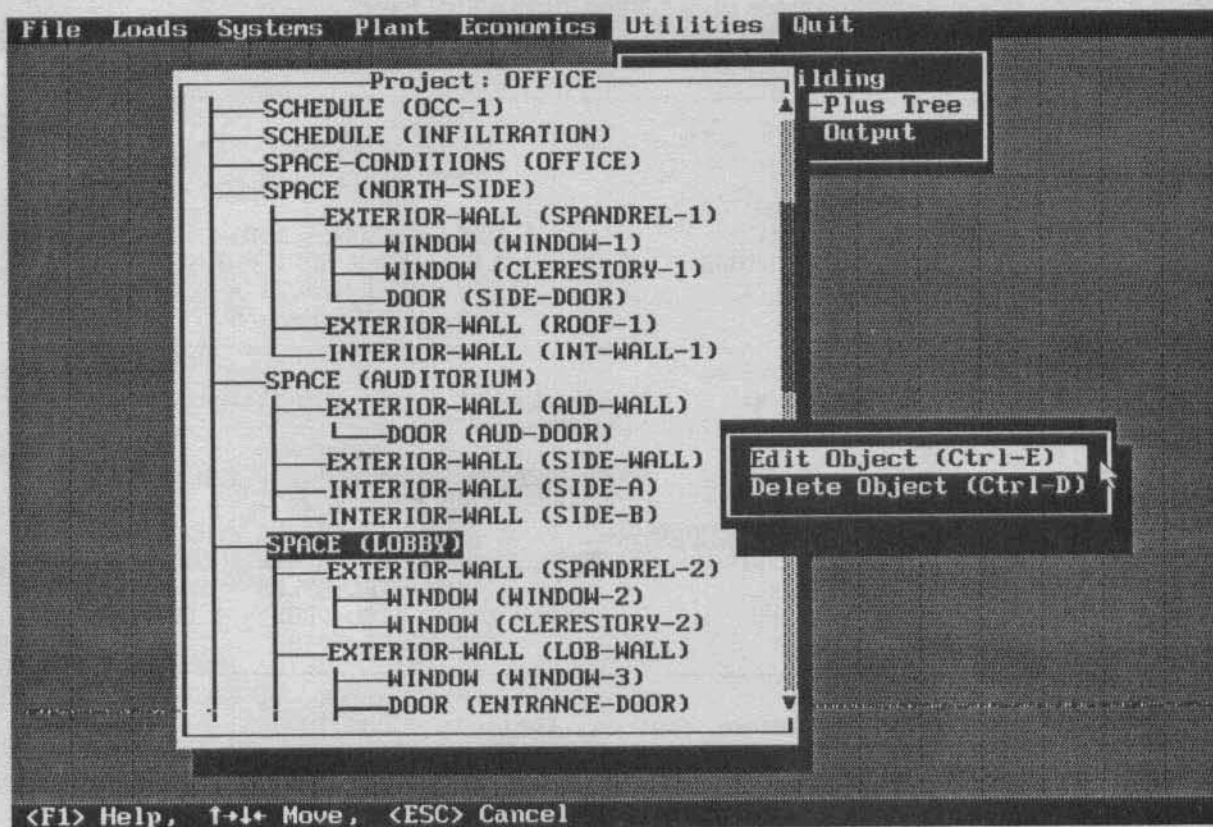
Press any key for a list of choices (Default = CONTINUOUS)

<F1> Help, ↑↓ Move, <ESC> Cancel

Figure 4 The same SPACE input window as Fig. 3 with an overlapping window showing optional keywords for the Daylighting category. A pop-up window is displayed with a choice of values for the LIGHT-CTRL-TYPE1 keyword.

Figure 4 shows a similar pop-up window that lists all the possible entries for the LIGHT-CTRL-TYPE1 field. In this case, the possible entries are DOE-2 codewords, rather than user-defined U-name, so there is no library option. The user chooses one of the codewords shown.

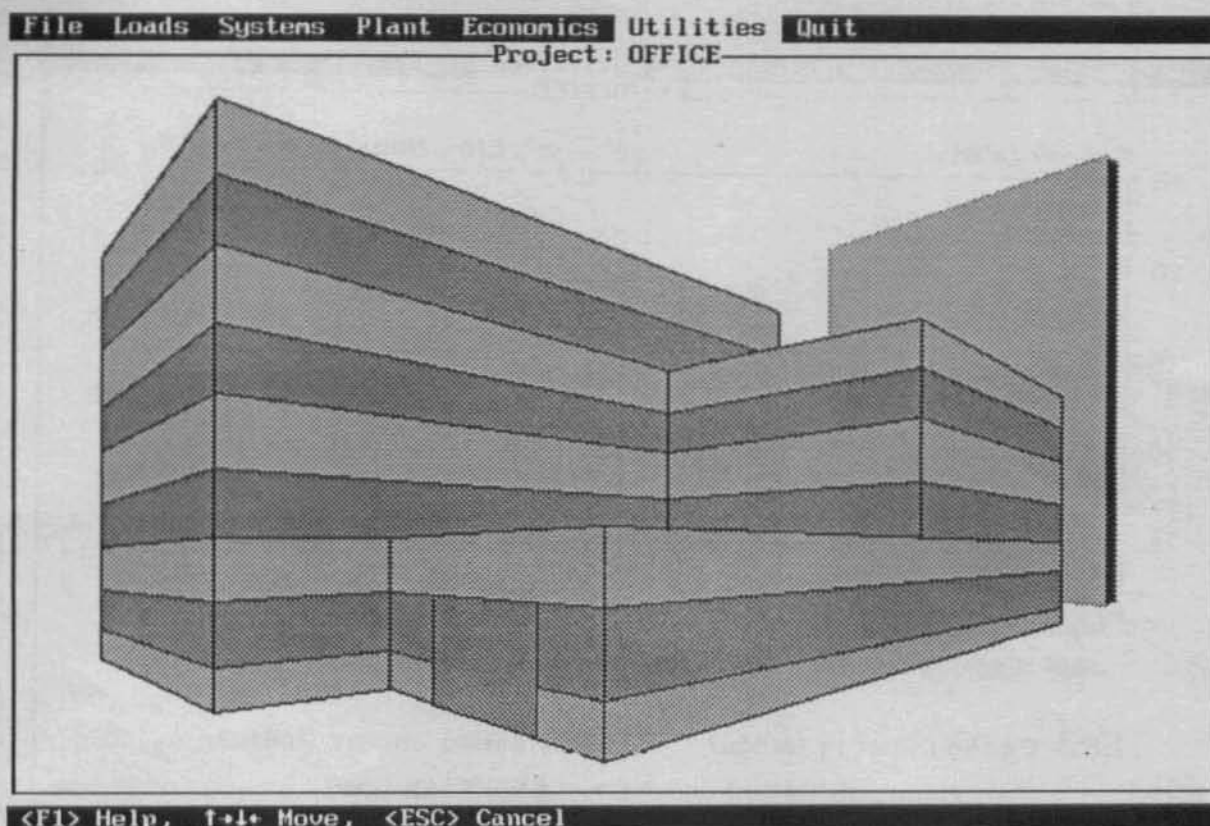
Figure 5 shows a DOE-Plus Tree of a file that was previously input; note the concise manner of describing a building by showing the DOE-2 commands as interdependent objects. Because each object is identified by its U-name, the user can quickly scan an entire building to see if all necessary objects have been specified. Clicking the mouse or cursor on a particular object activates a pop-up window giving an option of editing or deleting that object. If the user selects Edit, DOE-Plus displays the input window for that object with the data previously entered by the user. The user is then able to review or modify any of the input fields for that object. Selecting the Delete option deletes that object and any dependent objects from the tree and the data file (after confirmation by the user).



**Figure 5** A DOE-Plus Tree showing a concise description of a building, including interdependencies among objects. Objects are identified by user-defined U-name. Clicking on any object allows the user to Edit or Delete that object, in this case the SPACE named LOBBY.

The DOE-Plus Tree window scrolls up and down using the mouse, cursor, or page keys, so that the entire building can be viewed. The entire tree structure can also be printed to provide a hardcopy record of the building model.

Figure 6 shows a three dimensional view of a building that was input with DOE-Plus. Windows, doors, walls and shades are color-coded. This feature of DOE-Plus can be used to quickly locate misplaced objects. Although the geometrical locations of surfaces in a typical DOE-2 model of a building are often not exactly the same as the actual building, it is critical to the accuracy of the simulation to ensure that the surfaces are located properly.



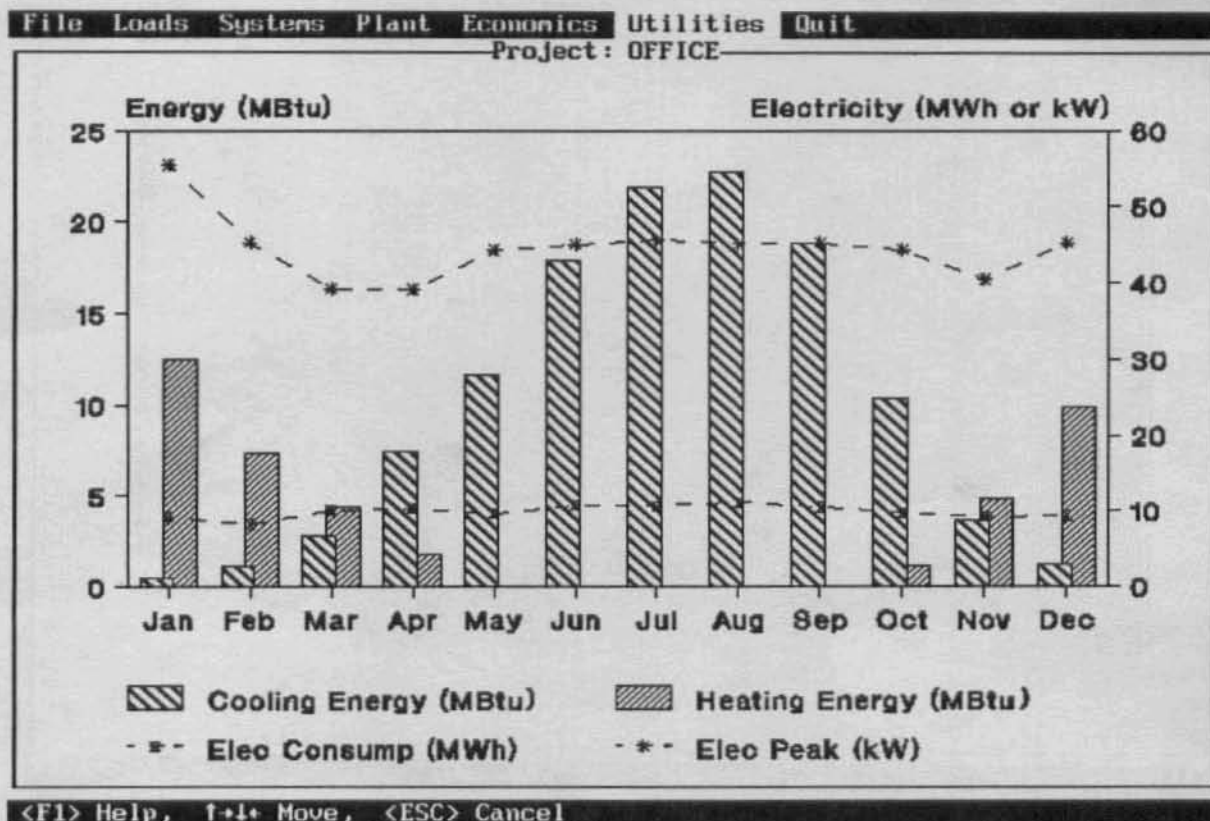
**Figure 6** A three-dimensional view of a building input to DOE-Plus. Two-dimensional plan views can also be drawn. Building views can be displayed on the monitor (as shown) or a graphics printer.

By clicking the mouse on a selected surface, the DOE-Plus Tree (Fig. 5) is displayed with that surface highlighted, providing the user with information on the surface U-name and relationship to other objects. The user is then able to immediately skip to the input window for that surface to edit or review input data. In this manner, the user can move back and forth between the input and display windows in order to view the effects of changes, for example, in the surface coordinates or azimuth.

DOE-Plus also has the ability to draw a two dimensional plan which can be useful in viewing especially complicated buildings. Both types of building views require a graphics monitor or printer.



Shown in Fig. 7 is an example of the DOE-Plus graphical output of DOE-2 simulation results. DOE-Plus can plot any of the results included in DOE-2 standard reports. The user simply selects variables to be plotted and such options as number of y-axes (1 or 2), type of plot (bar chart, pie chart, line plot, or combination thereof), and titles (for legend, y-axes, and plot). The plots are very useful for analyzing the results of a simulation and for reporting those results to clients. The plot feature of DOE-Plus requires a graphics monitor or printer.



**Figure 7** An example plot of results from a DOE-2 simulation. Users may select any combination of variables in standard DOE-2 reports, and style of plot (line, bar, pie, or combination as shown). Output may be displayed on the monitor or a graphics printer.

Figure 8 shows a utility of DOE-Plus that displays a full year calendar. The calendar can be paged forward (to show future years) or backward (to show past years) with the mouse, cursor, or page keys. The calendar is normally used for developing schedules when it is important to know the day of the week of a certain date. The calendar for any year can be printed.

File Loads Systems Plant Economics							Utilities							Quit													
1990																											
Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa							
Jan							Feb							Mar							Apr						
	1	2	3	4	5	6						1	2	3				1	2	3	4	5	6	7			
7	8	9	10	11	12	13	4	5	6	7	8	9	10	4	5	6	7	8	9	10	8	9	10	11	12	13	14
14	15	16	17	18	19	20	11	12	13	14	15	16	17	11	12	13	14	15	16	17	15	16	17	18	19	20	21
21	22	23	24	25	26	27	18	19	20	21	22	23	24	18	19	20	21	22	23	24	22	23	24	25	26	27	28
28	29	30	31				25	26	27	28				25	26	27	28	29	30	31	29	30					
May							Jun							Jul							Aug						
	1	2	3	4	5							1	2	1	2	3	4	5	6	7				1	2	3	4
6	7	8	9	10	11	12	3	4	5	6	7	8	9	8	9	10	11	12	13	14	5	6	7	8	9	10	11
13	14	15	16	17	18	19	10	11	12	13	14	15	16	15	16	17	18	19	20	21	12	13	14	15	16	17	18
20	21	22	23	24	25	26	17	18	19	20	21	22	23	22	23	24	25	26	27	28	19	20	21	22	23	24	25
27	28	29	30	31			24	25	26	27	28	29	30	29	30	31					26	27	28	29	30	31	
Sep							Oct							Nov							Dec						
30						1		1	2	3	4	5	6					1	2	3	30	31					1
2	3	4	5	6	7	8	7	8	9	10	11	12	13	4	5	6	7	8	9	10	2	3	4	5	6	7	8
9	10	11	12	13	14	15	14	15	16	17	18	19	20	11	12	13	14	15	16	17	9	10	11	12	13	14	15
16	17	18	19	20	21	22	21	22	23	24	25	26	27	18	19	20	21	22	23	24	16	17	18	19	20	21	22
23	24	25	26	27	28	29	28	29	30	31				25	26	27	28	29	30		23	24	25	26	27	28	29
Previous Year							Next Year							Cancel													
<F1> Help, ↑↓ Move, <ESC> Cancel																											

Figure 8 A full-year calendar, in this case for 1990. The user can page through years (forward or backward) with the mouse, cursor, or page keys.

### Requirements

DOE-Plus requires an IBM-PC compatible (including XT, AT and PS/2) computer with or without a graphics monitor. Graphics monitors supported are CGA, EGA, VGA, and Hercules. A full range of graphics printers are supported. Only the building views shown in Fig. 6 and the plots of simulation results shown in Fig. 7 require a graphics monitor or printer. A color monitor, hard disk drive, and mouse are recommended, but not required. If DOE-2 is to be run in an integrated environment with DOE-Plus, a 386 or 486 CPU with math co-processor is required.

### Availability

DOE-Plus was developed by, and is available directly from, Building Blocks Software, P.O. Box 5218, Berkeley, CA 94705-0218; phone (415) 549-1444. DOE-Plus is a trademark of Building Blocks Software of Berkeley, CA. All features subject to change without notice. (c) 1990,1991 by Building Blocks Software; all rights reserved.

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\$295  
\$100

# Index to the DOE-2 User News

Volume 1, No. 1 (August 1980) through Volume 11, No. 4 (Winter 1990)

KEY: The Index lists *User News* volumes, issues, and page numbers as follows: Name of Article, in parenthesis is the program version that was current when article appeared, then Volume, Number (No. 1=Spring, No. 2=Summer, No. 3=Fall, No. 4=Winter), and page number.

For example, the entry "Advanced Simulation (2.1C)...7:4,4-8" tells the reader that the article titled "Advanced Simulation", which appeared when DOE-2.1C was the current version of the program, will be found in *User News* Volume 7: Number 4, on pages 4 through 8.

## ADVANCED SIMULATION

Advanced Simulation (2.1C)...7:4,4-8  
DOE-2 and the Next Generation (2.1C)...6:4,1-2  
IBPSA (2.1C)...8:2,4-7

## BUGS

### in DOE-2.1

About bugs...1:1,3  
BDL...1:1,4-6; 1:2,6  
LOADS...1:1,6  
SYSTEMS...1:1,7; 1:2,7-8  
PLANT...1:1,9-10; 1:2,8  
Weather...1:2,6

### in DOE-2.1A

All bugs...3:4,3-6  
BDL...2:1,3-6; 2:2,9-10; 2:3,5;  
3:1,9-10; 3:1,13; 3:3,3  
LOADS...2:1,7; 2:3,5; 3:1,10  
SYSTEMS...2:1,8-12; 2:2,10-11; 2:3,5;  
3:1,10-12; 3:2,5; 3:3,3  
PLANT...2:1,12-14; 2:3,5; 3:1,12  
ECON...2:2,11  
Weather...2:1,6

### in DOE-2.1B

All bugs...5:4,3-6  
BDL...4:4,5; 5:1,4  
LOADS...4:4,6; 5:1,5  
PLANT...4:4,6; 5:1,5  
SYSTEMS...4:4,6; 5:1,5  
Weather...4:4,6; 5:1,5

### in DOE-2.1C

All bugs...9:3,4-16  
BDL...7:1,9-33; 9:1,4; 9:2,2  
ECON...7:1,9-33  
LOADS...7:1,9-33; 7:3,13-14; 8:1,6; 8:4,5  
PLANT...7:1,9-33; 8:4,6  
Reports...7:1,9-33; 8:1,6  
SYSTEMS...7:1,9-33; 8:4,4-5; 9:1,3-5  
Weather...7:1,9-33; 8:2,3

### in DOE-2.1D

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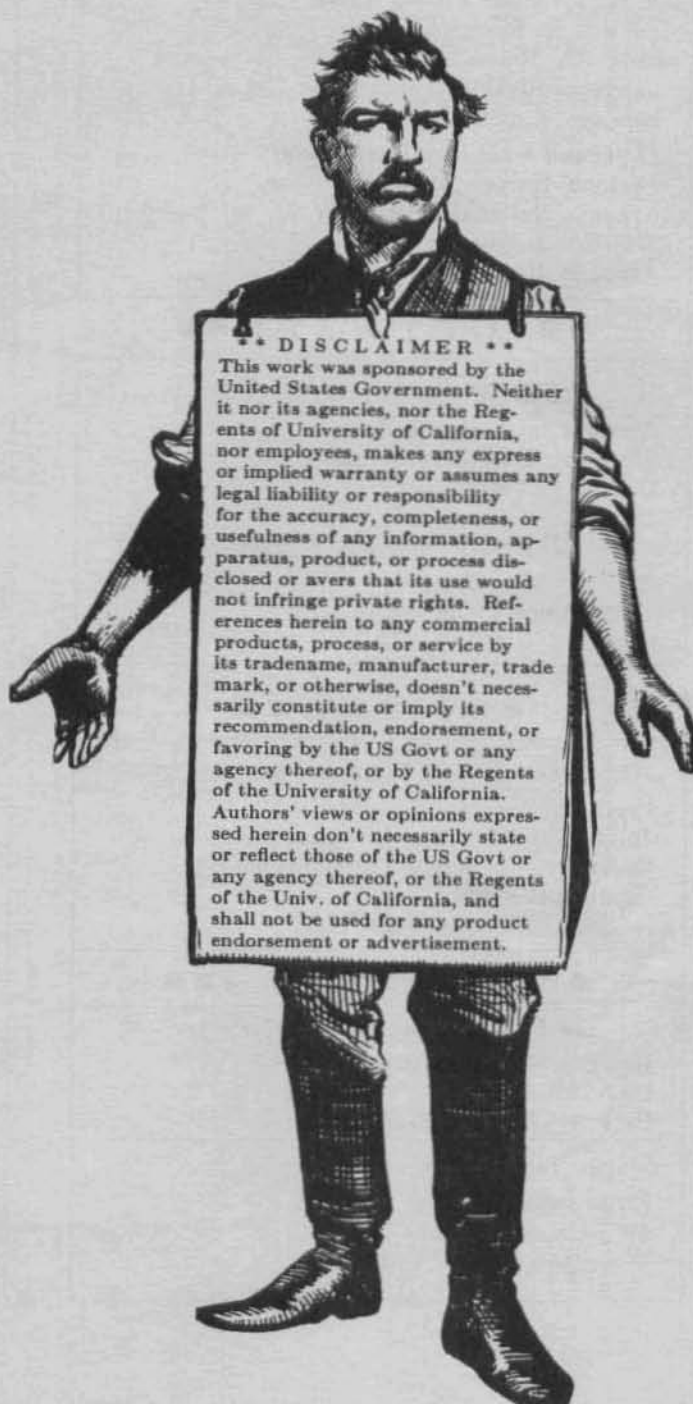
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# ■ ■ ■ ■ DOE-2 DIRECTORY ■ ■ ■ ■

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<p><i>(2.1D VAX and SUN-4 Only)</i> Simulation Research Group Bldg. 90, Room 3147 Lawrence Berkeley Laboratory Berkeley, CA 94720</p> <p><i>(2.1C and 2.1D Mainframe Only)</i> National Energy Software Center Argonne National Laboratory 9700 South Cass Avenue Argonne, IL 60439</p>
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